AF/3762
ZW

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Re App	:	Gheng Zhang et al	:	January 30, 2006
S.N.	:	09/206,329	:	Art Unit 3762
Filed	:	December 8, 1998		Examiner George Evanisko
For	:	AUTOCAPTURE PACING/SENSING CONFIGURATION		Our Docket No. 970663.CNC

LETTER

Mail Stop APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is a Response to Notification of Non-Compliant Appeal Brief (37 C.F.R. 41.37), in triplicate, the original and two copies of Appellant's Appeal Brief, together with three copies of a Claim Appendix and three copies of a Terminal Disclaimer (Exhibit A), in the above-identified patent application.

The Commissioner is hereby authorized to charge any fees or refund any overpayment under 37 CFR 1.16 and 1.17 which may be required by this paper to Deposit Account No. 08-1265.

Yours very truly,

NIKOLAI & MERSEREAU, P.A.

C. G. Mersereau

CGM/bld
Enclosures

Our Docket No. 970663.CNC

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Re App	:	Gheng Zhang et al.	:	January 30, 2006
S. N.	:	09/206,329	:	Group Art Unit 3762
Filed	:	December 8, 1998	:	Examiner George Evanisko
For	:	AUTOCAPTURE PACING/SENSING CONFIGURATION		

RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF (37 C.F.R. 41.37)

Mail Stop APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This paper is submitted in response to a Notification of Non-Complaint Appeal Brief Under 37 C.F.R. 41.37. In response to that notification, an amended Appeal Brief is being submitted herewith which addresses the specific items raised in the notification. Applicants believe that the Amended Appeal Brief is fully compliant

The brief now contains all the items required under 37 C.F.R. 41.37(c) using the proper heading definitions and in the proper order so that Item 1 of the notification should be met.

With respect to Item 4, the brief now contains a concise explanation of all of the elements of the independent claims

including references to the specification by page number and to the drawings by reference characters. This is done particularly with respect to every means plus function element.

With respect to Items 5 and 6, the brief now contains a concise statement of each ground of rejection presented for review as required by 37 C.F.R. 41.37(c)(1)(vi) and the brief presents a separate argument heading for the single ground of rejection of Item 5 as required by 37 C.F.R. 41.37(c)(1)(vii).

Finally, the error pointed out in the Claim Appendix with regard to claim 3 has been corrected. The brief should contain a correct copy of the appealed claims as required by 37 C.F.R. 41.37(c)(1)(viii).

Given the above, the amended brief being submitted herewith is believed to comply with all the requirements of 37 C.F.R. 41.37 and, accordingly, should be entered and considered.

Respectfully submitted,

NIKOLAI & MERSEREAU, P.A.

C. G. Mersereau
Attorney for Appellants
Attorney Reg. No. 26,205
820 International Centre
900 Second Avenue So.
Minneapolis, MN 55402
Telephone: (612) 339-7461

CERTIFICATE OF MAILING

I hereby certify that the foregoing Response to Notification of Non-Compliant Appeal Brief (37 C.F.R. 41.37), Amended Appeal Brief for the Appellant in triplicate, a Transmittal Letter in application Serial No.09/206,329, filed December 8, 1998, are being deposited with the U.S. Postal Service as First Class Mail in an envelope addressed to: Mail Stop APPEAL BRIEF - PATENTS, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, postage prepaid, on January 30, 2006.

Barbara L Davis

Barbara L. Davis
On Behalf of C. G. Mersereau

Date of Signature: January 30, 2006

Our Docket No. 970663.CNC

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Re App	:	Gheng Zhang et al.	:	January 30, 2006
S. N.	:	09/206,329	:	Group Art Unit 3762
Filed	:	December 8, 1998	:	Examiner George Evanisko
For	:	AUTOCAPTURE PACING/SENSING CONFIGURATION		

AMENDED APPEAL BRIEF FOR THE APPELLANTS

Mail Stop APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I. REAL PARTY IN INTEREST

The real party in interest is Cardiac Pacemakers, Inc., having offices at 4100 Hamline Avenue North, St. Paul, Minnesota 55112-5798, by virtue of Assignments from the inventors, each recorded December 8, 1998, at Reel 010297, Frames 0848-0851.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to the owner of the subject application, the owner's legal representative, or the inventors which will directly affect or be directly affected by or have a bearing on the Board of Patent Appeals and Interferences in the pending appeal to the present knowledge of the undersigned.

III. STATUS OF THE CLAIMS

The present application was filed on December 8, 1998 as Serial No. 09/206,329 and has undergone numerous Office Actions and amendments. A Terminal Disclaimer dated June 6, 2001 was filed with regard to two cited references, USPN 5,843,136 to zhu et al and USPN 6,044296 to Zhu et al. The Office Action from which this Appeal was taken was dated June 17, 2005. An After-Final Amendment was submitted August 22, 2005 and an Advisory Action was issued September 7, 2005. The Advisory Action did not indicate that the after-final response would not be entered. On September 26, 2005, a Notice of Appeal was filed in the present Appeal in which claims 1, 3-15, 17-19, 21-33 and 35-36 stand rejected and no claim has been allowed.

Thus, the present status of all the claims is as follows:

1(Rejected)

2(Cancelled)

3-15(Rejected)

16(Cancelled)

17-19(Rejected)

20(Cancelled)

21-33(Rejected)

34(Cancelled)

35-36(Rejected)

What Appellants believe to be a true copy of the claims presently appealed appears in the Claim Appendix attached to this Brief as Section VIII.

IV. STATUS OF AMENDMENTS

All amendments submitted in this application are believed to have been entered and are presently considered to be of record.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

Cardiac pacers have enjoyed widespread use and popularity through time as a means for supplanting some or all of an abnormal heart's natural pacing functions. The various heart abnormalities remedied by pacemakers include total or partial heart block, arrhythmias, myocardial infarctions, congestive heart failure, congenital heart disorders, and various other rhythm disturbances within the heart. The general components of a cardiac pacemaker include an electronic pulse generator for generating stimulus pulses to the heart coupled to an electrode lead arrangement (unipolar or bipolar) positioned adjacent or within a preselected heart chamber for delivering pacing stimulus pulses.

Regardless of the type of cardiac pacemaker employed to restore the heart's natural rhythm (ie: ventricular pacing, atrial pacing, or dual chamber pacing in both the atrium and

ventricle), each type operates to stimulate excitable heart tissue cells adjacent to the electrode of the pacing lead employed with the pacemaker, which may or may not result in capture. Myocardial response to stimulation or "capture" is a function of the positive and negative charges found in each myocardial cell within the heart. The success of a pacing stimulus and depolarizing or "capturing" the selected chamber of the heart hinges on whether the current of the pacing stimulus as delivered to the myocardium exceeds a threshold value referred to as the capture threshold.

The ability of a pacemaker to detect capture threshold is desirable in that delivering stimulation pulses having energy far in excess of the patient's capture threshold is wasteful of the pacemaker's limited power supply. Thus, it is desirable that the amount of stimulation energy delivered to the myocardium is maintained at the lowest level that will reliably "capture" the heart. To accomplish this, a process known as "capture verification" must be performed wherein the pacemaker monitors to determine whether an evoked depolarization occurs in the preselected heart chamber following the delivery of each pacing stimulus pulse.

The detection of evoked depolarization or "capture verification" is rendered very difficult due to polarization

voltages or "afterpotentials" which develop at heart tissue/electrode interface following the application of the stimulation pulses, thereby hampering the ability of the pacemaker to conduct automatic capture verification. Hence, there is a need for a cardiac pacing system that decrease and/or shortens the pacing afterpotentials.

The present invention provides a cardiac pacing system that attenuates, decreases and shortens pacing afterpotentials without significantly increasing the leading edge voltage pacing threshold and which may operate with a plurality of unipolar or bipolar leads without the necessity of a separate capture sensing lead and/or indifferent electrode. The pacing/sensing circuit of the invention may be utilized to determine whether a pacing stimulus directed to a selected atrium or ventricle evokes a response to the pacing stimulus. The preferred embodiment of the cardiac pacing system of the present invention includes an atrial pacing/sensing lead in a ventricle pacing/sensing lead electrically coupled to a cardiac pacemaker and includes leads for pacing in the atrium and/or ventricle, means for sensing an evoked response in the atrium and/or ventricle electrically coupled to the atrial and ventricle leads, an afterpotential attenuation means for attenuating the

afterpotential which results due to the application of a pacing stimulus to the heart.

As seen in the figures, the cardiac pacing system is one suitable for use with unipolar or bipolar atrial and ventricular pacing and sensing leads and includes at least an atrial lead 12 having atrial electrodes including an atrial tip electrode 28 and an atrial ring electrode 30 electronically coupled to the lead; and a ventricle lead 14 having ventricle electrodes including a ventricle tip electrode 32 and a ventricle ring electrode 34 electronically coupled to the lead. A pulse generator 20 for providing a pacing stimulus to at least one of an atrium or ventricle of a heart, the pacing means being electrically coupled to at least one of an atrial or ventricular lead. A sensing system for sensing a response evoked by the pacing stimulus in which the sensing device is electrically coupled to at least one of the atrial and ventricular leads and includes multiple independent blanking switches 58, 60 (Figure 7) corresponding to independent electrodes. An indifferent electrode 24 is provided and an electrically conductive can that contains the pacing and sensing systems 22, the indifferent electrode being situated on the can. An afterpotential attenuating system for attenuating afterpotentials (see Figure 8) is provided which is electrically coupled to the pacing means

and includes a first coupling capacitor 96 for attenuating afterpotential operatively coupled to a second coupling capacitor 94 for blocking DC components. A switch 90 is provided for selectively coupling the second coupling capacitor in series with the first coupling capacitor so as to reduce the effective capacitance of the second coupling capacitor. The system has a combined reduced coupling capacitance of less than five microfarads, preferably 1-2 microfarads.

An important aspect of the invention lies in the fact that, with the combination of the present invention, the sensing system can selectively sense evoked responses between all combinations of any two of the electrodes. The versatility of this system is further demonstrated by the Figures 3-6 which illustrate further that the evoked response sense amplifier may be electrically coupled to sense evoked response wave forms resulting from either an atrial pacing stimulus or a ventricular pacing stimulus with any two-electrode sensing configuration. The figures illustrate alternate embodiments of this versatile concept.

More specifically, the independent claims, 1 and 19, are directed to a cardiac pacing system for use with unipolar or bipolar atrial and ventricular pacing and sensing leads which includes the system for selectively sensing evoked responses

between any combination of electrodes. Each independent claim recites a series of elements, both independent claims 1 and 19 listing elements a-g.

The elements of claim 1 will now be described with reference to the specification and drawings. Elements (a) and (b) recite leads. Element (a) describes an atrial lead which is shown with reference to Figures 2-6 as including a tip electrode 28 and ring electrode 30. (See also the text at page 6, lines 7-11 and page 9, line 24-page 10, line 31.) Element (b) is to a ventricular lead which requires a ventricular tip electrode and a ventricular ring electrode. These are also shown at 32 and 34 in Figures 1 and 3-6 and described in the text referenced just above.

Element (c) describes a "pacing means" which is shown at 10 in Figure 10 and at 11 in Figure 2 and includes pulse generator 20 and pacing/sensing circuit 22. This element is further described with reference to the text at page 9, lines 13-20 and referenced at other places throughout the specification.

Element (d) is a sensing means which is described in Figure 7 and in the text from page 11, line 29-page 12, line 15. The blanking switches are shown at 58 and 60. The indifferent electrode 24 of element (e) is shown as being positioned on the can 18 in Figures 1 and 2 and in Figures 3-6. In the text, this

is described at page 9, lines 15-20, for example. Element (f), "afterpotential attenuation means" is shown, for example, in Figure 8 and is described in the specifications text beginning on page 13, line 18 through page 16, line 9. The "first coupling capacitor means" is designated 96 and the "second coupling capacitor means" is designated by the reference character 94. Finally, element (g) is a qualifying limitation which contains no new parts, however, this material is as described in the specification beginning at page 17, line 3 through page 18, line 15 and then in Figures 10-17. This material also describes specific sensing electrode parts as in the dependent claims.

With respect to the other independent claim, claim 19 includes elements a-g described above in terms of structure rather than means plus function language with respect to elements c, d, f and g. Thus, the pacing circuit of element c includes a charge storage capacitor shown at 54 in Figure 7 and coupling capacitor 56 in Figure 7. The text describing this is found at page 11, line 14-28. The remainder of the elements are believed to have been adequately described above and with reference to independent claim 1.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The statutory provision of 35 U.S.C. § 103(a) forms the sole basis for the rejection of claims 1, 3-15, 17-19, 21-33 and 35-36. Three references were relied upon by the Examiner. They include:

USPN 5,690,683 to Haefner et al
USPN 5,843,136 to Zhu et al
USPN 6,044,296 to Zhu et al

With respect to all the claims, the Examiner cited the combination of Haefner et al '683 in view of either Zhu et al '296 or '136.

More specifically, claims 1, 3-15, 17-19, 21-33, 35 and 36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Haefner et al. (USPN 5,690,683) in view of either Zhu et al. (USPN 5,843,136 or USPN 6,044,296).

In view of the foregoing, generally, the only issue to be decided on appeal is whether the references cited by the Examiner demonstrate that the subject matter of any of the claims fails to meet the requirement for patentability imposed by 35 U.S.C. § 103(a).

VII. ARGUMENTS

A. Grouping of Claims

Appellants believe that each and every claim should stand or fall on its own merits and that the limitations of each

should be considered separately. The rejections based on 35 U.S.C. § 103 have been applied to all of the claims. However, the dependent claims, when contrasted with independent claims 1 and 19, incorporate additional features which provide further support for their patentability. Accordingly, it is the belief of the Appellants that each and every claim should have the ability to stand or fall on its own merits and that the limitations of each should be considered separately. While the main thrust of the arguments will be directed to the independent claims at issue, the dependent claims add limitations and define combinations that should be considered on their own merits.

For example, many of the dependent claims require sensing between two specific electrodes selected as species from the concept that any two can be successfully used as evidenced by the independent claims.

B. <u>The Cited Art</u>

(1) Haefner et al '683

Haefner et al discloses an apparatus for removing afterpotential occurring after an electrical pulse in a cardiac rhythm management system such as a pacemaker system or cardioverter/defibrillator system having electrodes used for both sensing electrical activity of the heart and carrying the electrical pulse to the heart and a sense amplifier for

detecting electrical activity from the electrode. Both atrial and ventricular leads are disclosed. That apparatus includes a low-pass filter coupled to the electrode that sensed electrical activity. A high-pass filter is coupled between the low-pass filter and the sense amplifier to further filter the electrical activity passed from the low-pass filter. Equilibrium circuitry is included to allow pass of filter components of the low-pass filter and the high-pass filter to return to an equilibrium state following delivery of the electrical pulse. The possible use of bipolar or unipolar electrodes is discussed.

Haefner et al, however, fails to disclose either the coupling capacitance system or a system of blanking switches as in applicants' present invention.

(2) Zhu et al '136 or '296

These two patents are related as parent and continuation-in-part and, it is believed, that only the '136 patent qualifies as prior art. These patents are commonly owned by the assignee of record in this application as evidenced by the above-mentioned Terminal Disclaimer dated June 6, 2001. A copy of that Terminal Disclaimer is attached to this Brief as Exhibit A. This being the case, the Zhu et al '296 patent, having a filing date of June 2, 1998 (less than one year before the filing date of the present application) is disqualified as prior art with

respect to the present claims under MPEP 706.02(l)1, common ownership having been established in accordance with MPEP 706.02(l)2. This being the case, withdrawal of Zhu et al '296 as a reference is respectfully requested.

Zhu et al '136 discloses a method and apparatus for attenuating polarization voltages or "afterpotentials" which develop at the heart tissue/electrode interface following the delivery of a pacing stimulus to the heart tissue. This reference also is directed to detecting the evoked response of the pacing stimulants to determine whether each pacing pulse has resulted in heart "capture" or contraction to thereby attract the capture threshold for minimizing power consumption while maintaining proper heart rhythm. That device has a large capacitance coupling capacitor to suppress DC components of the pacing spike and a second capacitor connected in series with it, the second capacitor being shunted by a switch so that its value can be selectively inserted in series with the coupling capacitor to lower the overall capacitance of the coupling capacitor following delivery of the pacing spike.

Zhu et al '136 does contain an element usable in the presently claimed combination, however, as will be discussed, other critical elements are neither disclosed nor suggested by Zhu et al '136.

C. Authorities and Arguments

The rejections under appeal here are all based on a plurality of references. In determining the propriety of a rejection under 35 U.S.C. § 103 based on a plurality of references, it is well settled that the obviousness of an invention cannot be established by combining the teachings of the several pieces prior art absent some teaching, suggestion or incentive in the art itself supporting the combination. See *In re Fine,* 837 F.2d 1071, 5 U.S.P.Q. 2d 1596 (Fed. Cir. 1988). A test for obviousness is what the combined teachings of the references, taken as a whole, would have suggested to those having ordinary skill in the art. See *In re Kaslow*, 707 F.2d 1366, 217 U.S.P.Q. 1089 (Fed. Cir. 1983).

During the patent examination process, the U.S. Patent Office bears the initial burden of presenting a *prima facie* case of unpatentability. See *In re Oetiker*, 977 F.2d 1443, 24 U.S.P.Q. 2d 1443 (Fed. Cir. 1992). When the U.S. Patent Office fails to meet this burden, the appellant is entitled to the patent. However, when a *prima facie* case is made, the burden then shifts to the applicant to come forward with evidence and/or arguments supporting patentability to rebut the *prima facie* case. Patentability *vel non* is then determined on the entirety of the record, by a preponderance of the evidence and

the weight of the argument. See *In re Paisecki*, 745 F.2d 1468, 223 U.S.P.Q. 785 (Fed. Cir. 1984).

The initial burden of establishing a *prima facie* case of obviousness thus rests upon the Examiner and that burden can only be satisfied by showing that objective teachings in the prior art or knowledge generally attributed to one of ordinary skill in the art would have led such an individual to combine the relevant teachings of the cited references. It is also well settled that it is error to reconstruct the appellants' claimed invention from the prior art by using the appellants' claim as a "blueprint". When prior art references require selective combination to render a subsequent invention obvious, there must be some definitive reason for the combination to be made other than the hindsight obtained from the invention itself. See *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 227 U.S.P.Q. 543 (Fed. Cir. 1985). "One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to depreciate the claimed invention." In re *Fine*, supra (Fed. Cir. 1988).

"To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness". In re *Rouffet*, 149 F.3d 1350,

47 U.S.P.Q. 2d 1453 (Fed. Cir. 1998). "[T]he suggestion to combine requirement stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness." In re *Rouffet*, supra.

In analyzing whether claimed subject is properly rejected under 35 U.S.C. § 103 based upon a combination of prior art references, two factors must be considered: (1) whether the prior art would have suggested to one of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success. In re *Vaeck* 947 F.2d 488, 20 U.S.P.Q. 2d 1438 (Fed. Cir. 1991).

For the reasons discussed and those given below, appellants will show that the prior art references cited by the Examiner do not suggest the invention as a whole claimed in the subject application.

Even assuming that the asserted combinations are proper, the claims of appellants' application define an invention that is believed to be neither taught nor suggested by the references relied upon by the Examiner. The inventors have probed the strengths and weaknesses of the prior art and discovered an

improvement in versatility and simplicity that has escaped those who came before. This is indicative of unobviousness rather than obviousness. *Fromsen v. Anitec Printing Plates, Inc.*, 132 F.3d 1437, 45 U.S.P.Q. 2d. 1269 (Fed. Cir. 1997).

In fact, it will be shown that the references cited by the Examiner teach away from appellants' claimed invention and toward the use of a variety of different devices to address the combinations of Appellants' single device. A *prima facie* case of obviousness can be rebutted if the appellants can show that the art in any material respect taught away from the claimed invention. In re *Haruna*, 249 F.3d 1327, 58 U.S.P.Q. 2d 1517 (Fed. Cir. 2001). A reference "teaches away" when a person of ordinary skill, upon reading the reference, would be led in a direction divergent from the path taken by appellant. *Haruna*, supra citing *Tec Air Inc. v. Denso Manufacturing Michigan, Inc.*, 192 F.3d 1353, 1360, 52 U.S.P.Q. 2d 1294, 1298 (Fed. Cir. 1999).

The rejection of claims 1, 3-15, 17-19, 21-33, 35 and 36 under 35 U.S.C. § 103(a) as being unpatentable over Haefner et al '683, in view of either Zhu et al ('296 or '136) should not stand.

In addressing the rejection of the claims based upon the above combination, Appellants will assume that the Zhu et al '296 no longer applies. Whereas Haefner et al disclose certain

of the elements including atrial and ventricular leads and describes the possibility of using unipolar or bipolar electrodes, they apparently would require multiple devices to accomplish both modes. A bipolar system is illustrated. The Haefner et al reference does not disclose the afterpotential attenuation elements as claimed in Section (f) of claim 1 or claim 19, nor does it disclose a sensing circuit which meets the limitations of element (d) of either claim 1 or claim 19.

To overcome these and other deficiencies, the Examiner has combined the Haefner et al reference with Zhu et al. Zhu is cited to teach that it is known to have an afterpotential attenuation means which includes a first capacitor for attenuating afterpotentials coupled to a second capacitor for blocking DC components and including a switch for selectively coupling the capacitors in series to reduce the effective capacitance to allow the system to quickly sense evoked response after pacing. It then is deemed obvious to one having ordinary skill in the art to modify the device of Haefner et al with the afterpotential attenuating system of Zhu et al.

Whereas that combination does include many of the elements of Appellants' independent claims, this combination does not teach or suggest certain other elements of the claims including the requirement that the sensing circuit include "multiple

independent blanking switches corresponding to independent electrodes" as required in element (d) of the independent claims. It further follows that the various subcombinations or species found in the dependent claims which all include these limitations should also distinguish. It appears that the Examiner has looked for elements in the art to reject the calims based on hindsight given the Appellants' disclosure.

Because the system of the present invention enables capture sensing between any two electrodes and enables a versatility unknown in the prior art, it further minimizes the number of required components in a cardiac pacing system capable of many selective modes of operation. There is no need for a separate capture sensing lead and/or indifferent electrode in combination with the afterpotential attenuation means.

CONCLUSION

There is nothing in the cited references to suggest the combinations set forth in Appellants' claims. The new changes made by the Examiner to the previous rejections only bolster the arguments set forth in the original appeal. Appellant further believes that the Examiner has not sustained the burden of establishing a *prima facie* case of obviousness, and, therefore, rejection based on 35 U.S.C. § 103 should not stand.

Appellants are convinced that the present claims are patentable and it is respectfully requested that the final rejection of the Examiner be reversed and the claims be allowed.

Respectfully submitted,

NIKOLAI & MERSEREAU, P.A.

C. G. Mersereau
Attorney for Appellants
Attorney Reg. No. 26,205
820 International Centre
900 Second Avenue So.
Minneapolis, MN 55402
Telephone: (612) 339-7461

VIII. CLAIM APPENDIX

APPEALED CLAIMS

1. A cardiac pacing system for use with unipolar or bipolar atrial and ventricular pacing and sensing leads, said cardiac pacing system including:

(a) at least an atrial lead having atrial electrodes comprising an atrial tip electrode and an atrial ring electrode electrically coupled thereto;

(b) at least a ventricular lead having ventricular electrodes comprising a ventricle tip electrode and a ventricle ring electrode electrically coupled thereto;

(c) pacing means for providing a pacing stimulus to at least one of an atrium or ventricle of a heart, said pacing means electrically coupled to at least one of said atrial lead and said ventricular lead;

(d) sensing means for sensing a response evoked by the pacing stimulus, said sensing means electrically coupled to at least one of said atrial lead and said ventricular lead said sensing means including multiple independent blanking switches corresponding to independent electrodes;

(e) an indifferent electrode and an electrically conductive can that contains the pacing and sensing means, said indifferent electrode being positioned on the can;

(f) afterpotential attenuation means for attenuating afterpotentials which result due to the application of the pacing stimulus to the heart by said cardiac pacing system, said afterpotential attenuation means being electrically coupled to said pacing means and including first coupling capacitor means for attenuating afterpotential operatively coupled to second coupling capacitor means for blocking DC components, and also including switching means for selectively coupling said second coupling capacitor means in series with said first coupling capacitor means so as to reduce the effective capacitance of said second coupling capacitor means, said system having a combined reduced coupling capacitance of less than 5 microfarads; and

(g) wherein the sensing means can selectively sense evoked responses between all combinations of any two of said electrodes.

3. A cardiac pacing system as in claim 1 wherein the signal associated with the evoked response is sensed between the atrial tip electrode and the indifferent electrode.

4. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the ventricular tip electrode.

5. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the indifferent electrode.

6. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the ventricular tip electrode and the indifferent electrode.

7. A cardiac pacing system as recited in claim 1, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the indifferent electrode positioned on a can of the cardiac pacer and electrically coupled to the cardiac pacer.

8. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and one of the ventricular electrodes.

9. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the atrial tip electrode and one of the ventricular electrodes.

10. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the atrial tip electrode.

11. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the atrial tip electrode and the electrically conductive housing of the cardiac pacing system.

12. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the electrically conductive housing of the cardiac pacing system.

13. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the ventricular tip electrode.

14. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the electrically conductive housing of the cardiac pacing system.

15. A cardiac pacing system as in claim 1, wherein the signal associated with the evoked response is sensed between the ventricular tip electrode and the electrically conductive housing of the cardiac pacing system.

17. A cardiac pacing system as in claim 1, wherein said first coupling capacitor means has a substantially smaller capacitance than said second coupling capacitor means.

18. A cardiac pacing system as in claim 1, wherein said second coupling capacitor means has a capacitance ranging from 10-40 microfarads, and said first coupling capacitor means has a capacitance less than 5 microfarads.

19. A cardiac pacing system for use with unipolar or bipolar atrial and ventricular pacing and sensing leads, said cardiac pacing system including:

(a) at least an atrial lead having atrial electrodes comprising an atrial tip electrode and an atrial ring electrode electrically coupled thereto;

(b) at least a ventricular lead having ventricular electrodes comprising a ventricle tip electrode and a ventricle ring electrode electrically coupled thereto;

(c) a pacing circuit including a pacing charge storage capacitor that provides a pacing stimulus to at least one of an atrium or ventricle of a heart, said pacing circuit electrically coupled to at least one of said atrial lead and said ventricular lead;

(d) a sensing circuit that senses a response evoked by the pacing stimulus, said sensing circuit electrically coupled to at least one of said atrial lead and said ventricular lead, said sensing circuit including multiple independent blanking switches corresponding to independent electrodes;

(e) an indifferent electrode and an electrically conductive can that contains the pacing and sensing means, said indifferent electrode being positioned on the can;

(f) a plurality of coupling capacitors electrically coupled together including a first coupling capacitor that attenuates afterpotential, operatively coupled to a second coupling capacitor that blocks DC components, and also includes switches for selectively coupling said second coupling capacitor in series with said first coupling capacitor so as to reduce the effective capacitance of said second coupling capacitor, wherein a capacitance of the capacitors coupled together has a combined reduced capacitance of less than 5 microfarads wherein the combined reduced capacitance of less than 5 microfarads attenuates afterpotentials

which result due to the application of the pacing stimulus to the heart by said cardiac pacing system, said capacitors being electrically coupled to said pacing circuit; and

(g) wherein the sensing circuit can selectively sense evoked responses between all combinations of any two of said electrodes.

21. A cardiac pacing system as in claim 19 wherein the signal associated with the evoked response is sensed between the atrial tip electrode and the indifferent electrode.

22. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the ventricular tip electrode.

23. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the indifferent electrode.

24. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the ventricular tip electrode and the indifferent electrode.

25. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the indifferent electrode.

26. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and one of the ventricular electrodes.

27(previously presented). A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the atrial tip electrode and one of the ventricular electrodes.

28. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the atrial tip electrode.

29. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the atrial tip electrode and the electrically conductive housing of the cardiac pacing system.

30. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the electrically conductive housing of the cardiac pacing system.

31. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and ventricular tip electrode.

32. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the electrically conductive housing of the cardiac pacing system.

33. A cardiac pacing system as in claim 19, wherein the signal associated with the evoked response is sensed between the ventricular tip electrode and the electrically conductive housing of the cardiac pacing system.

35. A cardiac pacing system as in claim 19, wherein said first coupling capacitor has a substantially smaller capacitance than said second coupling capacitor.

36. A cardiac pacing system as in claim 19, wherein said second coupling capacitor has a capacitance ranging from 10-40 microfarads, and said first coupling capacitor has a capacitance less than 5 microfarads.